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leaves, and the third upon the fruit. The work will be a most valuable one, and it is to be hoped that it will be continued to completion. Every botanical department ought to afford this set, as the price (\$5 per volume) is very reasonable. The volumes are put up in book form, so that they may be placed upon ordinary library shelves.—*Charles E. Bessey.*

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## ZOOLOGY.

**THE CONTRACTILE VACUOLE.**—The dispute regarding the nature of the contractile vacuole in the protozoa is not at an end. Dr. De Bruyne records (*Bulletin Roy. Acad. Sci. Belg.* LVI., 1888), his belief that it does not communicate with the exterior, and that it is not possessed of excretory functions. Prolonged study tends to show that the contained fluid is not expelled from the protozoan, but that it is forced to other parts, to again return to form the vacuole. He would rather regard it as of respiratory and circulatory functions and thinks that the contained fluid may possibly have nutrient properties.

**AN ENDOPARASITE OF AMPHIURA.**—Dr. Fewkes records (*Proc. Boston Soc'y. Nat. Hist.*, XXIV., p. 31, 1888) the existence of a Copepod Crustacean parasitic in the brood cavity of the common Brittle Star, *Amphiura squamata*, at Newport, R. I. In the specimens affected the ovary had degenerated into an amorphous mass and that the cavity contained either the adult Copepod or eggs containing the young in all stages of development. Fewkes also records the existence of this parasite in another place (*Bulletin, M. C. Z.*, XIII., 1887) but does not give it a description or a name. Comparison should be made with *Cancerilla tubulata* which is described by A. Giard (*Comptes Rendus*, 1887, p. 1189) as parasitic upon the same brittle star at Fécamp. There the young attach themselves to the ends of the anus and approach the disc as they grow older.

**THE CLASSIFICATION OF THE MYRIAPODA.**—So far as I am aware, no naturalist has questioned the naturalness and homogeneity of the group of Myriapoda. To me it seems that this unity is apparent rather than real; that the Chilopods and Chilognaths are placed together on account of superficial resemblances, rather than from community of descent, upon which all true classification must be based, and that those features which they have in common are at the same time possessed by all the other air-breathing arthropods.

Every zoologist who has essayed the problem of homology presented by the head and the appendages, has made a more or less conspicuous failure, and this, as I am inclined to believe, has resulted solely from the fact that there is no true homology in these parts. I will not now discuss these points in detail, but will indicate the facts and reasons for my views.

A perfect definition should include all the objects intended to be defined, and at the same time exclude all others. Applying this we find it all but impossible in few or many words to frame a definition which will at once characterize all myriapods, and exclude the hexapods, and at the same time take into account structures which have any morphological value. The best we can do is somewhat after this fashion:—Myriapods are air-breathing Arthropods, with elongate bodies and more than three pairs of walking legs. Farther than this we cannot go, and even this definition will admit *Scolopendrella* which many now regard as a *Thysanure*.

Omitting for the present all mention of these features which all Myriapods have in common, we will take up the points of difference between Chilopods and Chilognaths.<sup>1</sup> The Chilognatha (Millepods, galley worms) have a head which bears, besides antennæ, only two pairs of appendages—a pair of jaws or mandibles, and an under-lip composed of the coalesced first maxillæ. To the head succeeds the more or less elongate equally segmented body of which a few anterior segments bear but a single pair of legs, while all the rest bear two pairs of appendages, thus apparently affording an exception to Savigny's law that each segment of an Arthropod can bear but a single pair of appendages. The bases of these legs are placed close to each other, the sternal surface being reduced to an extremely narrow plate, or being entirely wanting.

In the Chilopods, on the other hand, the head bears three pairs of mouth-parts, a pair of mandibles and two pairs of maxillæ while each segment of the body bears but a single pair of walking legs, and these are widely separated at their base by the broad sternal element. Numerous attempts, as was said above, have been made to introduce homology between these two groups in these respects. Heathcotes researches show, that the diplopodous segments

<sup>2</sup> Phila Trans. Vol. clxxix., B. (1888).

of *Iulus* are in reality double, but they also show that in the head there are no traces of more than two pairs of post-oral appendages.

In the Chilopods the Stigmata which communicate with the trachea, are placed at the sides of the body in the thin membrane joining the dorsal and ventral plates, thus being clearly above and outside the line of the legs; in *Scutigera* they are dorsal. In the Chilogn-

<sup>1</sup> *Pauropus* and the *Pauropida* are omitted because we know almost nothing of their internal structure and their development.

gnaths the stigmata are placed beneath or even in the coxal joints of the legs.

In the genital organs the most marked differences occur. In the Chilognaths both ovary and testis consist of a simple sac-like organ, communicating by a double oviduct or vas deferens with the paired genital openings situated one on either side, at or behind the bases of the second pair of legs. In the Chilopods, on the other hand, the sexual organs possess but a single efferent duct, and this opens in the middle line of the posterior end of the body just below and in front of the anus. In the Chilognaths both ovary and testis are below the intestine, a position indicating inferiority. In the Chilopods they have their origin in the same position which they permanently occupy in the other group, but with development they come to occupy a place above the alimentary tract. The spermatozoa, in the Chilognaths, are quiescent; in the Chilopods they are active. The position and character of the genital ducts in the Chilognaths is such as to lead to the supposition that here, as in many other metameric forms, they may have had their origin in a pair of segmental organs which have become specialised for carrying away the generative products. Heathcote's account of the development of the generative glands of *Iulus* certainly does not oppose this view. In the Chilopods, on the contrary, there is nothing in the adult structure (we know nothing of the development) which would even suggest such an origin for the generative ducts.

Now these points are all of considerable morphological importance, as we must, for instance, go far back in the ancestry to find a condition from which we can derive the two types of generative organs mentioned above, and exactly what structure that ancestor must have had it is difficult to say. It is, however, clearly impossible to derive either condition occurring in the Myriapods from the other.

If, however, we turn to existing forms to find the nearest relations of either group, our search is to a certain extent easy, for the next of kin of the Chilopods are certainly found in the Hexapoda. In all those points where Chilopods and Chilognaths disagree, the Chilopods and Hexapods are in harmony. Both have the same number of mouth-parts; both have the appendages segmentally arranged; the spiracles the same, while there is no little similarity between genital organs, ducts, and openings. Indeed taking *Scolopendrella* into consideration, it seems impossible to frame a definition which will serve to separate all the Hexapods from the Chilopods. It would seem then that we should unite both Chilopods and Hexapods in one class.

With regard to the Chilognaths, it seems not so easy to trace relationships. So far as is apparent, they form a group by themselves with no nearer affinities than those presented by the Anne-

lids. Peripatus, of which so much was expected in throwing light upon the origin of the "Tracheates" seems to fail in this respect, and must be regarded as nearer to the Annelids than to either Myriapod or Hexapod stock.—*J. S. Kingsley.*

**BLOOD CORPUSCLES OF THE LAMPREY.** — S. H. Gage states (*The Microscope*, VIII.) that the blood corpuscles of the lamprey are unlike those of the non mammalian vertebrates and like the mammals in being biconcave, circular and in forming rouleaux. They, however, possess a distinct nucleus, not easily seen in the fresh blood, but rendered visible by staining and by reagents.

**FIBRES OF SHORT MUSCLES.** — In order to ascertain whether the statement made by Köl liker that in the short muscles of the fish, frog and bat, the fibres are of the same length as the muscle, and have rounded ends, is applicable to the more minute vertebrates, Mrs. S. P. Gage has studied the muscles of the mouse, shrew, bat and English sparrow. She concludes (*The Microscope*, VIII.) that the muscular fibres may extend from end to end or may terminate at one or both ends within the muscle, tapering to a point. She further shows that in the muscle fibres even in the limbs and trunk the fibre may branch at either end and that anastomoses may occur between two adjacent muscle fibres in the mouse; and concludes that the difference between the skeletal and cardiac muscles is not so great as has been supposed.

**NOTES ON THE AMERICAN TRIONYCHIDÆ.** — According to Agassiz there are six species of American Trionychidæ, belonging to three different genera.

I am indebted to Prof. G. Brown Goode and Mr. F. A. Lucas, of the Smithsonian Institution; to Prof. A. Agassiz and Dr. S. Garman, of the Museum of Comparative Zoology in Cambridge;<sup>1</sup> to Prof. A. Gunther and Mr. G. A. Boulenger, of the British Museum, to Prof. O. C. Marsh, of the Peabody Museum, to Mr. T. Gillespie, of Hard Times Landing, La.; for the opportunity they have given me to examine a great number of American Trionychidæ.

As a preliminary report I may note the following conclusions:—

1. The type of *Testudo ferox* Schneider, described by Garden = Pennant in the Philosophical Transactions of London for 1771, is not *Platypeltis* of Agassiz; but a species of *Aspidonectes*.

2. *Platypeltis ferox* of Agassiz is not *Testudo ferox* Schneider, but a new species, which may be called *Platypeltis Agassizii*.

3. *Callinia microcephala* Gray, of the British Museum, with the locality Sarawak, is *Amyda mutica* Les.

<sup>1</sup> To Prof. Angelo Heilprin of the Philadelphia Academy.

According to my researches there are the following American Trionychidæ.

*Platypeltis* Agass.

1. *Platypeltis agassizii* mihi. = *Platypeltis ferox* Agass. non Schneider.

*Aspidonectes* Wagler.

2. *A. ferox* Schneider.
3. *A. asper* Ag.
4. *A. spinifer*, Les. = *A. nuchalis* Ag.
5. *A. emoryi* Ag.
6. *A. muticus* Les.

At the same time I should like to call attention to the enormous sexual difference in *Aspidonectes muticus* Les. It is well-known that the males have very much longer tails than the females on all the Trionychidæ. The male of *A. muticus* has the plastron more developed than the female: the Hyo-, and Hypoplastra meet with the callosities nearly in the median line. The callosities extend very much more in the male than in the female; in an adult male the callosities cover the plastral-bones entirely. A very peculiar circumstance is, that the adult male is only about half as large as the adult female and that the males are in considerably smaller number than the females. Among thirty-six specimens of *A. muticus* from the Ohio River, there were only seven males. The fishermen consider the males and females as different kinds of animals, so great is the difference.

I do not know yet, whether the other Trionychidæ show the same considerable sexual difference. It is very interesting, however, that *Podocnemis* shows it.

Toao Martins da Silva Coutinho,<sup>1</sup> makes the following remarks about the male of *Podocnemis expansa*.

"The male, named *Capitary*, is distinguished from the female, by its size; it is only about 0, 7 m long (the female 1, 2m and more) and the tail which is twice as long, reaches a length of 1. 2 m.—The circumstance that only a small number of *Capitary* are found among hundreds of females, proves, in some way, that a single male is sufficient for the fecundation of a greater number of females."—*G. Baur, New Haven, Conn.*

McGEE ON MEADOW LARKS AND RILEY ON ENGLISH SPARROWS.—At a meeting of the American Ornithologists' Union, held in the hall of the National Museum in Washington, Prof. McGee, of the Geological Survey, read a paper detailing his observations upon the two forms of North American meadow larks, as found in Iowa.

<sup>1</sup> Sur les Tortues de l'Amazone, Bulletin de la Société Imperial d'acclimatation, Avril, 1868.

The two species or geographical varieties, whichever they may be, are distinguished by certain peculiarities in their song. The eastern species, *Sturnella magna*, extends about two-thirds way across the State of Iowa, while the western form, *S. neglecta*, is found nearly as far east as the Mississippi River. At their extremes of distribution both of the forms are easily recognized, and are typical examples. But in the intervening region, where the two overlaps, as it were, the birds were not to be positively separated by note alone, a sight of the bird itself being generally necessary for positive identification. Whether the variation in song was due to imitation of one by the other or to an actual intermingling of the two, he did not attempt to decide. In referring to the reason for the distribution of the two species, the agency of the glacial period was evoked. At the time when the ice reached its greatest extension southward, the waters of the Gulf of Mexico extended northward, forming a junction with the ice and dividing the continent into an eastern and a western portion. The suggestion was made that if at a period anterior to the glacial epoch one species was widely distributed over the continent, the time that elapsed until the normal condition of the country was again reached was sufficiently long to allow differentiation to proceed, and two species or distinct varieties to be formed.

In the discussion which ensued Dr. Cones took the ground that a very long period of times was not absolutely necessary for the formation of new races, varieties or species: that environment or food often causes changes with considerable rapidity, and that it is probable new species, so-called, are being formed under changing conditions in our own day and in short periods of time. Dr. Merriam mentioned that changes in coloration are often due to change of food: that a breeder in Holland was so well known for his skill in "coloring up" Flamingoes, that these birds were sent to him from all parts of Europe. By some change in food, a secret known only to himself, he was enabled in a short time to restore them to full color. Yet in a short time the new color was lost and the original faded aspect resumed. Prof. C. V. Riley cited numerous instances of the distribution of insects similar to that of the meadow larks. Dr. Gill called attention to similar cases with fishes. (It may be well to note here similar parallel cases in the plant world. *Clematis viorna* is a well-known, widely distributed plant of eastern North America, extending, however, only as far west as Kansas, where it is not common. *C. pitcheri*, classed by some as a variety of *Viorna*, is a western form found nowhere east of the lower Wabash valley in Indiana, but extending westward through Missouri, Arkansas and Texas. It is extremely probable that the two forms owe their distribution to the same cause or causes as the two forms of meadow lark above referred to. Some species of Verno-

nia (Ironweed) seem in similar positions. Four of the species are exclusively trans-Mississippi. One oversteps the boundary into west Tennessee. Two others, on the contrary, are eastern and central species which overlap the others by extending into Iowa and Kansas. It is further interesting to find certain hybrids between the eastern and the western forms, which, if they came from the debatable ground of Iowa, Missouri and Kansas, would furnish additional interest to the problem.

Another paper read at the same meeting was by Prof. Riley, upon the English sparrow. Examination of the stomachs of more than five hundred specimens showed that only from fifteen to seventeen per cent of the whole number contained any insect remains at all. The rest contained grains or seeds of various sorts, straw and gravel. The insects found belonged to all orders, and were generally such as are either harmless to the agriculturalist or even actually beneficial. The stomach of a single specimen of a truly insectivorous bird contained two hundred and fifty web worms. Such a bird would do more good in ridding trees of various insects than all of the eighty-two sparrows in whose stomachs insect remains were found. Investigations of a similar nature carried on by Mr. Charles Dury, of Cincinnati, lead to a similar conclusion, that the value of the English sparrow as an insect destroyer is nothing compared to that of a truly insectivorous bird, and that it is injurious rather than beneficial.—*Jos. P. James.*

**BROCAS CONVOLUTION IN THE APES.**—Dr. Hervé in the *Bulletin de la Société d'Anthropologie de France* (April, 1888), discusses the disputed question as to the development of the third (Brocas) frontal convolution in the monkeys. After an examination of the homologies of the fissures presented by that region of the brain, he finds that it is wanting or extremely rudimental in the Quadrumana, while it is present in the Anthropomorpha, though smaller in the apes (Simiidae) than in man. This is interesting, as it confirms the evidence from the osteology, that the apes and man form a natural group, distinct from the monkeys and lemurs. It also points to the possibility of teaching some of the apes to speak, and also to the probable gradual acquisition of this important characteristic of man.—*E. D. Cope.*

**ZOOLOGICAL NEWS: PROTOZOA.**—In the *Zoologischer Anzeiger* (No. 286), G. Cattaneo called attention to the existence of a parasitic ciliate infusorian (*Anophrys maggi*) in the blood of the crab, *Carcinus mænas*. In the same Journal (No. 292) Géza Entz describes the occurrence of another Ciliate (*Nyctotherus cardiformis*) in the blood of *Apus canceriformis*.

Rupert Valentin records the presence (*Zool. Anz.*, 292) often in comparatively large numbers of psorosperm masses in the tissues of two species of *Lucernaria*. In each mass the spores were in various stages of development.

Franz Leydig also calls attention to the fact that in 1860 he described parasites in the blood of *Daphnia*, *Lyncius* and *Cyclops*, and complains that he also called attention in his *Natural History* of the *Daphnidæ* to their existence in the blood and other tissues of sick silkworms, a fact which has been overlooked by all subsequent students of the diseases of the silkworm.

Dr. Stokes describes a number of North American Flagellata in *Jour., of the Royal Microscopical Society* for October. The forms are *Mastigamœba flexuosa*, *Cercomonas truncata*, *C. heterofilum*, *C. lapsa*, *C. undulans*, *C. mutabilis*, *Heteromita granulifera*, *H. tremula*, *H. stagnalis*, *H. sphagni*, *H. nasuta*, *H. parvifilum*, *Tetramitus frondarius*, *Hexamita truncata*, *Atractonema pusilla*, *Hymenomonas flava*, *H. fusiformis*, *Zygoselmis obovata*, *Stereomonas parvula*, *Anisonema obliqua*, *Hymenona* (nov. gen.), *sphagni*, and *Petalomonas orbicularis*. There is no definite locality assigned to any of the species.

Mr. C. D. Sherborn has recently published in London a volume of 152 pages, devoted exclusively to a bibliography of the Foraminifera, recent and fossil.

SPONGES.—Wierziński (*Verhandl. k. k. zool-bot. Gesellsch.*, Wien, 1888) thinks that all the so-called species of *Euspongilla* are but one in reality, the differences being the result of environment. He also found near Lunberg a sponge which he regarded as closely allied to Pott's *Spongilla terrænovæ*, but afterward concluded that both his form and the Newfoundland species were deformed individuals of *Myenia mülleri*.

CŒLEENTERATES.—Vogt thinks that *Arachnactis* is not, as the younger Agassiz thought, the young of the *Edwardsia* but a distinct genus allied to *Cerianthus* and like the latter retaining its distinctly bilateral character throughout life. Though he does not expressly say so, Vogt is apparently ready to adopt the view that in the Hydrozoa as in the Anthozoa the free-swimming form is the primary and the attached condition secondary and adaptive.

WORMS.—O. Zacharias records (*Biol. Centralblatt*, VIII., p. 542) the occurrence of a land planarian (*Geodesmus terrestris*) between the gills of the mushroom (*Agaricus deliciosus*).

About two years ago we referred to the account given by Dr. Walker, of Buffalo, concerning the life history of the tape worm of

fowls. He claimed that the intermediate host of the worm *Syngamus* was to be found in the earthworm. Recently (*Nature*, XXXVIII., p. 324) Lord Walsingham gives facts collected from the experience of sportsmen which tend to corroborate this view. In dry summers when but few earthworms come to the surface, game fowl are comparatively free from the disease, but when worms are abundant, the fowl are more difficult to rear.

G. Brandes, in a preliminary communication embodying his anatomical discoveries, points out that the Trematode *Holostomum* has been regarded wrong side up, the "ventral" surface of authors being really dorsal and that the "larval anus" of the Tetracotyle stage of the worm is but the beginning of a gland and its duct, the alimentary canal ending blindly in the body parenchyma.

Dr. J. W. Fewkes describes and figures (*The Microscope*, 1888) a new type of marine larva found in the Bay of Fundy, and in Massachusetts Bay, which is regarded as having brachiopod, chætopod, and bryozoan features, but which seems to be nearest Mitraria in its affinities. The adult to which it belongs is unknown. Fewkes, in conclusion, has some remarks upon the characters of the common ancestor of Polyzoa, Brachiopoda, and Chætopoda, which lead him to suggest as a name for this hypothetical form "that of Mitraria, which up to the present is applied simply to the larval form of a single genus of Chætopoda."

Iijima and Nusata record some new cases of the occurrence of *Bothriocephalus liguloides* in Vol. II. of the *Journal of Science* of the University of Tokio.

MOLLUSCA.—Some sixty years ago Desmarest and Lesueur proposed to issue a series of illustrations of Polyzoa and Hydrozoa, and fourteen plates were engraved on copper by the latter. A few of the plates were distributed, but no accompanying text was ever prepared. Recently E. Pergens (*Procès-Verbal de la Soc. Roy. Malacol. Belg.*, Sept., 1887) has examined the original manuscripts and the types preserved in Havre, and has given identifications of the Polyzoa there figured.

PROTOZOA.—The Martini-Chemnitz "Conchylien-Cabinet" still appears at intervals. Numbers 356 to 361 have recently appeared, containing plates of *Cardita*, *Pecten*, *Spondylus*, *Cerithiidae*, *Chama*, *Cardita*, *Solen*, and *Modiola*.

Paul Pelseueer denies (*Bull. Scientif. France et Belgique*) the existence of a group of Orthonerous Gastropoda.

CRUSTACEA.—According to the *Journal of the Royal Microscopical Society*, D. Bergendal has described the occurrence of distinctly male copulatory appendages on female crabs. In many cases there

were no appendages on the first segment of the abdomen; in others spoon shaped; in a few like those of the male. Only the useless and normally rudimentary first pair of appendages show this modification, the second pair which are functional are never modified in this way.

**TUNICATA.**—Prof. Herdman, in the *Proceedings of the Biological Society of Liverpool* (1887, p. 24), thinks that recent investigations tend to establish that the pineal gland and the pituitary body of the Vertebrata, are both of them the remains of organs which reached the surface of the head in the ancestral Chordata, the pineal in the form of a median dorsal organ of sight; the pituitary possibly also as a sense organ placed on the front of the head close to the mouth opening.

**BIRDS.**—Dr. R. W. Shufeldt contributes to the *Auk* (Vol. V., Oct., 1888) figures of the skulls of *Habia melanocephala* and *Pipilo megalonyx*, from which he shows that the grosbeaks are possessed of skeletal characters not shared by any other fringilline birds, and are possibly entitled to family rank.

Mr. N. S. Goss, of Topeka, Kansas, wishes information concerning the western range of *Anas obscura*, the black duck. He is inclined to doubt its occurrence west of the Mississippi, all the specimens which he has examined proving to be the Florida duck.

**MAMMALS.**—At the meeting of the Linnean Society of New South Wales, Aug. 29th, 1888, Professor Tate exhibited a salted and sun-dried mammal from Alice Springs, Central Australia. In general appearance the animal resembled a Cape Mole (*Chrysochloris*). Its teeth and limbs indicated an insect diet and a burrowing life. Though no marsupial bones were seen on cursory examination, the marsupial character was shown by marginal folds bordering the lactiferous area, which also, together with some other points, indicated affinity to the Monotremes as well. The dentition is said to resemble that of the purassic genera. According to the natives it was the second specimen seen for sixteen years. A full description will be given later by Mr. Zietz, of the South Australian Museum.